Determinants of overall quality of life in women over the first year after surgery for early stage breast cancer

den Oudsten, B.L.; de Vries, J.; van der Steeg, A.F.W.; Roukema, J.A.; van Heck, G.L.

Published in:
Quality of Life Research

Publication date:
2009

Qual Life Res (2009) 18:1321–1329
DOI 10.1007/s11136-009-9548-1

Determinants of overall quality of life in women over the first year after surgery for early stage breast cancer

Brenda L. Den Oudsten · Jolanda De Vries · Alida F. W. Van der Steeg · Jan A. Roukema · Guus L. Van Heck

Accepted: 13 October 2009 / Published online: 28 October 2009

Abstract
Purpose Scores on quality of life (QOL) domains and facets are probably subject to fluctuations across time due to the course of breast cancer treatment. Existing QOL studies have been cross-sectional. Therefore, this prospective follow-up study examined whether QOL domains (physical health, psychological health, social relationships, and environment) and QOL facets contributed differentially across time to overall QOL in women with early stage breast cancer.
Methods From the 608 participating women, 225 women had early stage breast cancer. Before diagnosis and 1, 3, 6, and 12 months after surgical treatment, women with early stage breast cancer were assessed on QOL (WHOQOL-100).
Results Psychological Health and Social Relationships were the QOL domains that contributed to overall QOL most consistently at the various time points. Physical Health appeared to be a contributor at all time points except 1 month after surgery. Environment contributed to a lesser extent to overall QOL compared with Physical Health, Psychological Health, and Social Relationships. Different facets contribute to overall QOL-dependent of particular measurement points. However, the facets Positive Feelings and Personal Relationships were important factors at almost all time points of maintaining a good overall QOL.
Conclusions QOL domains and facets contributed differently to overall QOL at various time points across treatment in women with early stage breast cancer.

Keywords Breast neoplasm · Quality of life (QOL) · WHOQOL-100 · Longitudinal

B. L. Den Oudsten (✉) · J. De Vries · J. A. Roukema · G. L. Van Heck
CoRPS - Center of Research on Psychology in Somatic Diseases, Department of Medical Psychology, Tilburg University, P.O. Box 90153, 5000 LE Tilburg, The Netherlands
e-mail: B.L.DenOudsten@uvt.nl
URL: http://www.tilburguniversity.nl/corps

G. L. Van Heck
TRANZO - Scientific Centre for Transformation in Care and Welfare, Tilburg University, Tilburg, The Netherlands

A. F. W. Van der Steeg
Department of Pediatric Surgery, Emma Children's Hospital AMC and VU Medical Centre, Amsterdam, The Netherlands

J. A. Roukema
Department of Surgery, St. Elisabeth Hospital, Tilburg, The Netherlands

J. De Vries
Department of Medical Psychology, St. Elisabeth Hospital, Tilburg, The Netherlands

Introduction

In general, definitions of QOL emphasize that QOL is multidimensional representing psychological, physical, and social well-being [1]. QOL represents subjective evaluations of oneself, one's social and material world, and reflects the extent to which the individual is satisfied with them or is bothered by problems in those areas [2]. In line with this principle, the World Health Organization Quality of Life Group (WHOQOL Group) defined QOL as "an individual's perception of his/her position in life in the context of the culture and value systems in which he/she lives and in relation to his/her goals, expectations, standards and concerns. It is a broad-ranging concept incorporating in a complex way the person's physical health,

psychological state, level of independence, social relationships, personal beliefs and their relationship to salient features of the environment" (p. 1405) [3]. In line with this conceptualization, the WHOQOL Group has developed the WHOQOL-100 instrument. This questionnaire assesses three levels of QOL: (a) the first level corresponds with overall QOL, (b) the second level consists of the separate domains of QOL, and (c) the third level is formed by the specific aspects within each domain.

Few studies have examined the contribution of physical, psychological, and social well-being to patient's evaluations of overall QOL [4–6] in breast cancer [7]. According to Leventhal and Colman [8], there is a "need to assess the importance assigned to various experiential domains in making quality of life judgments, and the need to understand that people observe, and then integrate, experienced events into quality of life judgments" (p. 758). Recently, also Lu et al. [9] stated that it is important to acquire detailed information regarding the contributions of separate domains and facets of QOL to overall QOL judgments. When examining these contributions, it is quite conceivable that the salience, meaning, and importance of the domains and their consistent facets as well as the ways they are integrated will change over time. From a theoretical point of view, knowledge about the relationships between lower level assessment of QOL and higher level assessment is important, since it provides insight in the process underlying overall QOL judgments [4].

The present prospective follow-up study examined the relationships between QOL domains (second level: Physical Health, Psychological Health, Social Relationships, and Environment) and facets (third level), on the one hand, and overall QOL (first level), on the other hand, at several moment in time in women with early stage breast cancer. In addition, this study examined which baseline assessments of QOL domains and facets contributed substantially to overall QOL at 1 year after surgical treatment. We hypothesized that the association between different QOL domains and facets, on the one hand, and overall QOL, on the other hand, in early stage breast cancer patients would differ across time [10]. Patients' QOL domain preferences may change over time depending on demographic, disease characteristics, and life situation [7, 11]. For instance, it is quite conceivable that facets of physical health and social relationships will be more important during the first months after surgical treatment, while facets of psychological health would be rated as most important in later time periods. Arnold et al. [12] found that psychological functioning as well as physical functioning was the predominant determinant of an overall impression of individuals' QOL. The major impact of physical functioning, especially fatigue, was also supported in a recent study on patients with lung or breast cancer [7]. Other studies have pointed at the domain of social relationships [12]. In contrast, the physical environment and environmental changes seem to be less important to obtain and maintain a certain level of QOL [13]. Therefore, we hypothesized that the Environment domain would contribute to a lesser extent to the prediction of overall QOL compared with Physical Health, Psychological Health, and Social Relationships. Finally, it was expected that facet scores belonging to the domains of Social Relationships and Psychological Health assessed at baseline, would play a significant role in the prediction of overall QOL 1 year after surgical treatment. This is based on the expectation that high levels of perceived quality of social relationships and psychological health will have a buffer function later on, while low levels will contribute increase of psychological vulnerability and lack of needed social support. Finally, due to the fact that the literature does not point at differential determinants of overall QOL for BC patients that differ in terms of treatment, we examined in an exploratory way that domains and facets contribute to overall QOL in these treatment groups.

Method

Participants

Women with a palpable lump in the breast or an abnormality on a screening mammography were referred by their general practitioner to the surgical outpatient clinics of the St. Elisabeth Hospital (Tilburg, The Netherlands), the Maasland Hospital (Sittard, The Netherlands), or the Jeroen Bosch Hospital (Den Bosch, The Netherlands). The present study, in which the contributors to overall QOL and predictors of overall QOL are examined, is part of a larger prospective follow-up study focusing on the role of personality in early stage breast cancer patients' QOL.

The data were collected from September 2002 until September 2006. Of the 799 eligible women, 609 (76.2%) completed the first set of questionnaires before diagnosis was known. The main reasons for not participating were the length of questionnaires and the amount of stress women experienced at their first visit at the hospital. Of these 609 women, 223 were subsequently diagnosed with early stage breast cancer. Women who had a history of abnormalities in the breast, benign or malignant, or had a breast tumor that was too large (>5 centimeter) for breast conserving therapy, were excluded from the study. In order to participate, the women had to be able to write and read in Dutch. The questionnaires were completed before the women visited the surgeon and radiologist, i.e., before the diagnosis, benign or malignant, was known. After the baseline measurement (in-clinic self-administered), women completed questionnaires (by mail) at 1 month and 3, 6,

and 12 months after surgical treatment. The reference point was surgical treatment because otherwise follow-up measures would interfere with the timing of treatment modalities. Participation in the study was not known to the surgeon in attendance and, therefore, did not affect treatment and clinical follow-up. All participants gave written informed consent. This study was approved by the local ethical committee.

Measurements

QOL was measured at all time points using the WHOQOL-100 [10, 14], a cross-culturally developed generic multidimensional instrument. This instrument covers 24 facets, assessed with 96 questions, and one General Health and Overall Quality of Life facet (four questions). In this study, we used this General Health and Overall Quality of Life facet as the dependent variable. Because this scale also included one item on subjects' satisfaction with general health, we decided to exclude this particular item from the analysis. Each facet of the WHOQOL-100 is measured with four items using a 5-point Likert scale. The 24 facets were initially scored in six domains of QOL: Physical Health, Psychological Health, Levels of Independence, Social Relationships, Environment, and Spirituality, Religion, and Personal Beliefs [14]. Nowadays, it is well accepted to convert these 24 facets into four domains as described by the WHOQOL group [15–17]. In general, high facet scores indicate good QOL, except for Pain and Discomfort, Negative Feelings, and Dependence on Medication or Treatments. The time frame of reference is the previous 2 weeks. Reliability and validity [10, 15, 17] are adequate, and sensitivity [18] is high. Recently, the WHOQOL-100 was validated in a group of breast cancer patients, women with benign breast problems, and breast cancer survivors [17]. Cronbach's alpha coefficients ranged for the domains from .76 (Social Relationships) to .88 (Environment) in the breast cancer group. At the facet level, the internal consistency exceeded .72 for all facets in all groups [17].

Sociodemographic and clinical variables

Information on sociodemographic data (age, partner status, educational background, and employment status) was obtained by self-report prior to diagnosis. Clinical information (diagnosis, disease stage, type of surgery, tumor size, adjuvant therapy) was obtained from the medical files.

Statistical procedure

Student *t*-tests and Chi-square tests were used to examine the potential differences between (a) participants and non-participants; (b) participants and women who dropped out of the study; and (c) patients who received BCT and MTC. Multiple linear regression analyses (method: enter) were used to examine the associations of QOL domains and facets, on the one hand, and overall QOL at the various time points, on the other hand (from 1 month after surgery onwards). In order to preserve statistical power, two preliminary multiple linear regression analyses were run. First, we determined which QOL domains (Physical Health, Psychological Health, Social Relationships, Environment) were significantly associated with overall QOL at a given time point. Second, those QOL facets of a significant contributing domain were entered in a subsequent regression analysis. For instance, if Psychological Health (at 1 month after surgery) was associated with overall QOL (at 1 month after surgery), the facets belonging to that particular domain (Positive Feelings, Cognitive Functions, Self-esteem, Body Image and Appearance, Negative Feelings, and Spirituality Religion Personal Beliefs) were entered in the regression analysis. Thus, dependent and independent variables entered in the regression analyses were measured at the same time point. The final analysis included all facets that were significantly associated with overall QOL for a given time point. In order to determine whether QOL domains and facets assessed at baseline predict overall QOL at 12 months after surgery, multiple

Table 1 Sociodemographic and clinical characteristics of the participants at baseline

	Breast cancer group ($n = 225$)
Sociodemographic variables	
Age at diagnosis (mean ± SD)	58.7 (9.4)
Living with a partner (yes/no/missing)	180 (80.0)/38 (16.9)/7 (3.1)
Having children (yes/no/missing)	191 (84.9)/29 (12.9)//5 (2.2)
Education level	
0–9 yrs/10–14 yrs/> 14 years/missing	83 (36.9)/95 (42.2)/38 (16.9)/9 (4.0)
Paid work (yes/no/missing)	86 (38.2)/136 (60.4)/3 (1.3)
Type of surgery	
BCT/MTC/No surgical treatment	106 (47.1)/115 (51.1)/4 (1.8)
Adjuvant therapy	
Yes/No	171 (75.9)/54 (24.1)
Disease stage	
Stage 0	26 (11.6)
Stage I	92 (40.9)
Stage IIa	68 (30.2)
Stage IIb	35 (15.6)
Indefinable	4 (1.8)

For the sociodemographics, percentages are between brackets (except for age)

MTC, modified radical mastectomy; *BCT,* breast conserving therapy

linear analyses were used. Again, preliminary analyses were used (as described earlier). However, different time points were now used. Statistical significance was designated at a p value of .05 or smaller. In addition, separate multivariate regression analyses were done for determining the contributing domains and facets in women who received BCT or MTC. QOL domains and facets at baseline were now used to predict overall QOL at 12 months after surgery. All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS Chicago, IL, USA; version 14.0).

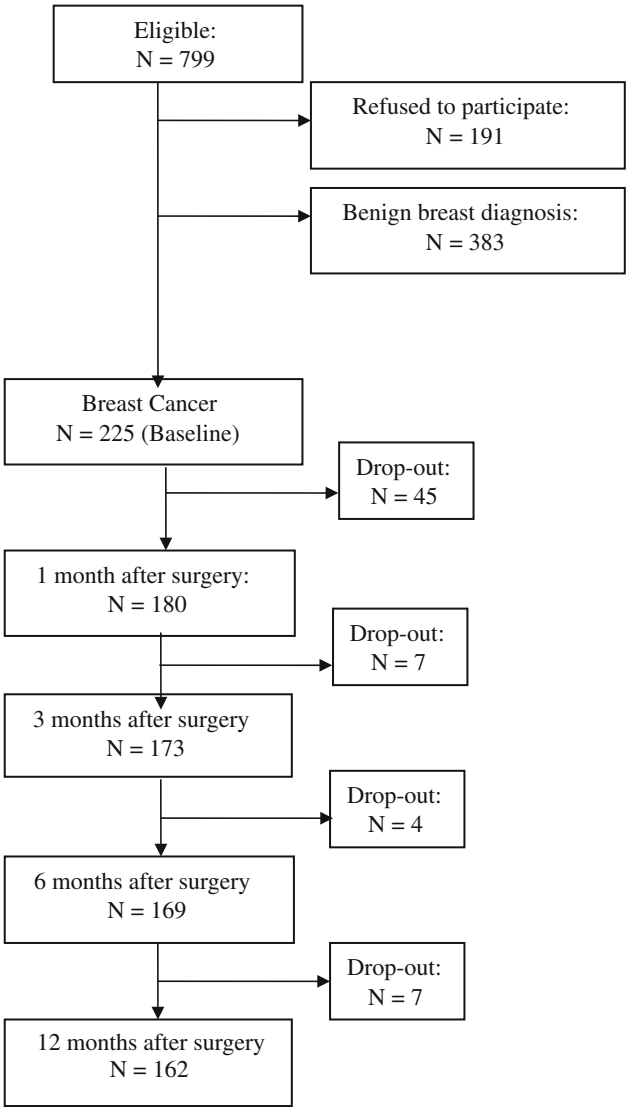

Fig. 1 Flow chart of participants

Results

Demographic and clinical characteristics are presented in Table 1. Participants did not differ from non-participants. However, participants who dropped out of the study were significantly older (61.52 ± 10.7) compared with the participants remaining in the study (57.48 ± 8.58; $p = .009$). They did not differ on other sociodemographic or clinical characteristics. Women who received BCT did not differ from women who received MTC regarding sociodemographic variables. However, women with BCT received more often adjuvant treatment compared with women who received MTC ($\chi^2 = 29.63$; $p < .0001$). Figure 1 presents the flow chart of this study.

Associations between QOL domains and overall QOL based on cross-sectional data

Preliminary analysis showed that the Physical Health domain (only 1 month after surgery) and Environment domain (only at three months after surgery and at 12 months after surgery) did not significantly contribute to overall QOL. Therefore, facets belonging to Physical Health and Environment were left out of further analyses at these time points (Table 2). At all time points, overall QOL was associated with the domains Psychological Health and Social Relationships.

Table 2 Preliminary multivariate linear regression analyses: contribution of QOL domains to overall QOL (cross-sectional data)

Independent variables QOL domains (level 2)	Before diagnosis $N = 210$		1 month after surgery $N = 146$		3 months after surgery $N = 150$		6 months after surgery $N = 156$		12 months after surgery $N = 152$	
	β	CI	β	CI	β	CI	β	CI	β	CI
Physical health	.23***	.08 to .27	.09 ns	−.04 to .18	.27***	.10 to .30	.20**	.05 to .23	.16*	.03 to .22
Psychological health	.28***	.13 to .36	.46***	.28 to .55	.42***	.26 to .50	.35***	.17 to .39	.45***	.27 to .49
Social relationships	.22***	.08 to .28	.26***	.10 to .30	.22***	.08 to .27	.28***	.12 to .30	.23**	.07 to .25
Environment	.18*	.03 to .28	.15*	.01 to .25	.07 ns	−.05 to .18	.17**	.04 to .24	.14 ns	−.00 to .22
F value	62.44***		60.13***		71.67***		87.28***		84.51***	
Adjusted R^2	.54		.62		.65		.69		.69	

Ns, not significant; *QOL,* quality of life; *β,* standardized regression coefficients; *CI,* confidence interval

*** $p < .0001$, ** $p < .001$, * $p < .05$

Table 3 Preliminary multivariate linear regression analyses: contribution of QOL facets to overall QOL (cross-sectional data)

Independent variables QOL facets (level 3)	Before diagnosis		1 month after surgery		3 months after surgery			6 months after surgery		12 months after surgery
	β	CI	β	CI	β	CI	β	CI	β	CI
Physical health	$N = 208$				$N = 155$			$N = 156$		$N = 151$
Pain and discomfort	−.13 ns	−.18 to .01			−.04 ns	−.13 to .07	−.16 ns	−.21 to .01	−.14 ns	−.20 to .02
Energy and fatigue	.26*	.05 to .25			.18 ns	−.03 to .21	.07 ns	−.09 to .17	−.13 ns	−.18 to .05
Sleep and rest	.16*	.02 to .14			.19**	.03 to .18	.10 ns	−.01 to .15	.13 ns	−.00 to .13
Mobility	−.05 ns	−.11 to .05			.26**	.06 to .26	.13 ns	−.05 to .18	.14 ns	−.02 to .20
Activities of daily living	.11 ns	−.06 to .20			.23 ns	−.02 to .30	.28*	.01 to .33	.28*	.01 to .34
Dependence of medication	−.06 ns	−.10 to .04			.04 ns	−.07 to .12	−.11 ns	−.15 to .02	−.01 ns	−.08 to .08
Working capacity	.11 ns	−.03 to .15			−.00 ns	−.11 to .11	−.00 ns	−.13 to .12	.27*	.02 to .28
F value	14.52***				18.03***			15.77***		16.49***
Adjusted R^2	.31				.44			.40		.42
Psychological health	$N = 210$		$N = 145$		$N = 151$			$N = 153$		$N = 151$
Positive feelings	.43***	.24 to .47	.25**	.06 to .39	.30***	.13 to .41	.40***	.19 to .45	.47***	.26 to .49
Cognitive functions	.13*	.00 to .20	.14 ns	−.00 to .22	.16*	.01 to .23	.23**	.07 to .26	.24***	.09 to .26
Self-esteem	.17*	.03 to .28	.27**	.07 to .39	.18 ns	−.01 to .35	.19*	.02 to .28	.13 ns	−.03 to .23
Body image and appearance	−.02 ns	−.08 to .06	.02 ns	−.08 to .09	.09 ns	−.02 to .15	.04 ns	−.05 to .09	.04 ns	−.05 to .09
Negative feelings	−.13*	−.15 to −.01	−.20**	−.25 to −.04	−.19**	−.22 to −.03	−.08 ns	−.15 to .04	−.12 ns	−.15 to .01
Spirituality/religion/beliefs	.02 ns	−.06 to .08	.10 ns	−.01 to .15	.09 ns	−.02 to .12	.03 ns	−.05 to .08	.06 ns	−.02 to .09
F value	34.24		37.15***		40.82***			46.69***		59.17***
Adjusted R^2	.49		.60		.61			.64		.70
Social relationships	$N = 204$		$N = 137$		$N = 138$			$N = 143$		$N = 136$
Personal relationships	.49***	.30 to .54	.62***	.39 to .68	.54***	.30 to .64	.43***	.22 to .50	.54***	.28 to .54
Social support	.06 ns	−.05 to .14	.07 ns	−.08 to .19	.10 ns	−.06 to .19	.30***	.10 to .32	.14 ns	−.01 to .20
Sexual activity	.24***	.07 to .21	.12 ns	−.01 to .16	.16*	.01 to .18	.17**	.03 to .17	.15*	.01 to .14
F value	56.95***		53.50***		44.23***			46.69***		51.67***
Adjusted R^2	.45		.54		.48			.64		.53
Environment	$N = 205$		$N = 132$					$N = 148$		
Physical safety and security	.16*	.03 to .21	.17*	.01 to .28				.22*	.058 to .35	
Home environment	−.00 ns	−.11 to .11	.12 ns	−.06 to .28				.12 ns	−.04 to .22	
Financial resources	.11 ns	−.01 to .14	.00 ns	−.12 to .11				.04 ns	−.07 to .12	
Health and social care	.04 ns	−.07 to .15	.02 ns	−.119 to .14				.13 ns	−.02 to .22	
Opportunity for acquiring skills	.05 ns	−.06 to .14	.12 ns	−.05 to .23				−.08 ns	−.18 to .08	
Participation in leisure	.54***	.27 to .46	.57***	.29 to .53				.49***	.23 to .44	
Physical environment	.07 ns	−.04 to .15	−.16*	−.28 to −.01				−.02 ns	−.13 to .10	

Table 3 continued

Independent variables QOL facets (level 3)	Before diagnosis		1 month after surgery		3 months after surgery		6 months after surgery		12 months after surgery
	β	CI	β	CI	β	CI	β	CI	CI
Transport	−.06 ns	−.12 to .04	−.10 ns	−.17 to .04			.00 ns	−.10 to .10	
F value	29.98***		20.38***				28.96***		
Adjusted R^2	.53		.53				.60		

Due to the fact that at 1 month after surgery, the physical health domain was not significantly related to overall QOL, no *p* values and confidence intervals are included. The same applies to facets belonging to the Environment domain at 3 months after surgery as well as 12 months after surgery. The column *p* value also contains the standardized regression coefficients

Ns, not significant; *CI*, confidence interval

*** $p < .0001$, ** $p < .001$, * $p < .05$

Table 3 reveals that facets belonging to the physical domain, for instance, Sleep and Rest, Mobility, Activities of Daily Living, and Working capacity turned out to be relevant at some point(s) in time. The facets Sleep and Rest and Mobility, for instance, contributed to overall QOL especially in the first month after surgical treatment, while Working Capacity became significantly associated with overall QOL 1 year after surgical treatment. The facet Positive Affect was significantly associated with overall QOL across all time points. However, Negative Feelings contributed to overall QOL until the first three months after surgery. All facets belonging to the Social Relationships domain were associated with overall QOL at some time points. However, Personal Relationships was positively associated with overall QOL across *all* time points. Several facets, for instance, Body Image and Appearance and Spirituality Religion Personal Beliefs, were not significantly associated with overall QOL throughout all analyses. Compared with the Physical Health domain and Social Relationships domain, the facets of the Psychological Health domain explained the largest proportion of variance in the association with overall QOL across time (adjusted $R^2 > .63$).

In the final analyses, the most consistent facets contributing to overall QOL was Personal Relationships. Other facets, for instance, Self-esteem (at 1 month after surgery) and Cognitive Functioning (at 3 months after surgery), contributed only once to overall QOL. Table 4 presents the standardized regression coefficients, confidence intervals, ANOVAs, and adjusted R^2 for the multivariate regression analyses.

Predictors of overall QOL based on prospective data

Table 5 shows the predictors of overall QOL after surgical treatment. Women with breast cancer were split up according to the surgical treatment they have received: breast conserving therapy and mastectomy. Preliminary analyses showed that the domain Physical Health as assessed before diagnosis ($\beta = .30, p < .022$) predicted overall QOL at 12 months after surgery in women with the breast conserving therapy. Environment ($\beta = .22, p < .0001$), assessed at baseline, predicted significantly overall QOL (at 12 months after surgery) in the women who received mastectomy. The Dependence of Medication facet ($\beta = .36, p < .02$) was the only predictor of overall QOL in the breast conserving therapy group, while Health and Social Care ($\beta = .37, p < .002$), Participation in Leisure ($\beta = .22, p < .04$), and Transport ($\beta = .23, p < .04$) predicted overall QOL in the mastectomy group.

Discussion

The aim of this prospective follow-up study was to examine which QOL domains and facets contribute

Table 4 Final multivariate linear regression analyses: contribution of QOL facets to overall QOL (cross-sectional data)

	Independent variables QOL facets (level 3)	Domain	β	CI	p value
Before diagnosis	Energy and fatigue	PH	.08	−.01 to .11	.13
	Sleep and rest	PH	.03	−.04 to .07	.56
	Positive feelings	PsyH	.20	.06 to .26	.002
	Cognitive functioning	PsyH	.07	−.04 to .14	.23
	Self-esteem	PsyH	.01	−.10 to .12	.89
	Negative feelings	PsyH	−.09	−.12 to .01	.09
	Personal relationships	SR	.24	.10 to .30	<.0001
	Sexual activity	SR	.14	.02 to .14	.01
	Physical safety and security	E	.01	−.08 to .09	.88
	Participation in leisure	E	.23	.07 to .25	.001
	F value = 35.80				<.0001
	Adjusted R^2 = .63				
1 month after surgery	Positive feelings	PsyH	.15	−.01 to .29	ns
	Self-esteem	PsyH	.17	.00 to .28	.046
	Negative feelings	PsyH	−.12	−.18 to .01	ns
	Personal relationships	SR	.30	.12 to .39	<.0001
	Physical safety	E	.08	−.05 to .18	ns
	Participation in leisure	E	.21	.03 to .27	.012
	Physical environment	E	−.09	−.18 to .03	ns
	F value = 42.48				<.0001
	Adjusted R^2 = .67				
3 months after surgery	Sleep and rest	PH	−.06	−.10 to .03	ns
	Mobility	PH	.27	.09 to .23	<.0001
	Positive feelings	PH	.22	.06 to .34	.004
	Cognitive functioning	PsyH	.13	.00 to .19	.047
	Negative feelings	PsyH	−.13	−.19 to .01	ns
	Personal relationships	SR	.32	.15 to .40	<.0001
	Sexual activity	SR	.02	−.06 to .08	ns
	F value = 46.02				<.0001
	Adjusted R^2 = .74				
	ADL	PH	.16	.03 to .16	.004
	Positive feelings	PsyH	.28	.10 to .36	.001
6 months after surgery	Cognitive functioning	PsyH	.05	−.05 to .12	ns
	Self-esteem	PsyH	.11	−.03 to .20	ns
	Personal relationships	PH	.01	−.12 to .14	ns
	Social support	SR	.20	.06 to .23	.001
	Sexual activity	SR	.11	.00 to .12	.038
	Physical safety	E	.17	.04 to .26	.007
	Participation in leisure	E	.05	−.07 to .14	ns
	F value = 46.02				<.0001
	Adjusted R^2 = .74				
12 months after surgery	ADL	PH	.05	−.08 to .14	ns
	Working capacity	PH	.06	−.06 to .13	ns
	Positive feelings	PH	.46	.26 to .48	<.0001
	Cognitive functions	SR	.02	−.06 to .09	ns
	Personal relationships	SR	.32	.13 to .35	<.0001
	Sexual activity	SR	.07	−.02 to .10	ns
	F value = 46.02				<.0001
	Adjusted R^2 = .68				

Ns, not significant; *PH,* physical health; *PsyH,* psychological health; *SR,* social relationships; *E,* environment; *ADL,* activities of daily living; *β,* standardized regression coefficients

Table 5 Predictors of overall QOL after surgical treatments (longitudinal data)

		Final analyses (QOL facets; level 3)			
	Domains	Facets	β	p value	CI
BCT	PH	Pain and discomfort	.10	.50	−.11 to .23
$N = 67$		Energy and fatigue	.21	.26	−.08 to .27
		Sleep and rest	.11	.40	−.07 to .17
		Mobility	.18	.27	−.07 to .24
		ADL	−.19	.38	−.34 to .13
		Dependence of medication	.36	.02	−.31 to −.03
		Working capacity	.02	.93	−.16 to .17
MTC	E	Physical safety and security	.12	.23	−.06 to .24
$N = 79$		Home environment	.03	.81	−.16 to .20
		Financial resources	−.04	.70	−.20 to .14
		Health and social care	.37	.002	.12 to .51
		Opportunity for acquiring skills	.05	.67	−.13 to .21
		Participation in leisure	.22	.04	.01 to .30
		Physical environment	−.03	.81	−.22 to .17
		Transport	.23	.04	.01 to .37

BCT, breast conserving therapy; *MTC,* mastectomy; *PH,* physical health; *E,* environment

significantly to overall QOL in women with early stage breast cancer during the first year after surgery. In this way, this study adds knowledge to our understanding of what determines the overall QOL scores of women with early stage breast cancer.

Two domains of QOL, i.e., Psychological Health and Social Relationships, were significantly associated with overall QOL at all time points, which is in line with the findings of a previous cross-sectional study [4]. It was also found in the latter study that psychological functioning was important in people with a broad range of chronic diseases as well as in healthy subjects, while social functioning was contributing to overall QOL in only some of the chronic diseases (i.e., back problems, rheumatoid arthritis, and migraine). Thus, findings indicate that there may be differences between disease populations. As a consequence, future studies should examine the role of second and third level aspects in different samples.

Our hypothesis that different QOL facets would determine overall QOL at a given time point after breast cancer diagnosis and treatment was confirmed in the final regression analysis. That is, two facets, namely Positive Feelings and Personal Relationships, were associated with overall QOL across almost all time points. However, other factors did turn out to be relevant at some point(s) in time, except for the facets Body Image and Appearance and Spirituality, Religion, and Personal Beliefs. These factors remained non-significant throughout all analyses. This is in line with, for instance, Andritsch et al. [19] who found that body image did not play a substantial role after 1–5 years after breast cancer diagnosis. Facets belonging to the Psychological Domain were the predominant determinants of overall QOL in early stage breast cancer. Physical Health contributed to a lesser extent to the explanation of overall QOL. This finding is in line with earlier studies [4, 12]. It was hypothesized that Physical Health would be contributing to overall QOL during the first months after surgical treatment as women are probably still recovering from treatment. However, this hypothesis was not confirmed. This finding is rather puzzling. Future studies should examine whether this is a robust finding or due to chance.

The WHOQOL-100 contains a facet Overall QOL and Health consisting of four items. Three of these items refer to QOL, while the other item explicitly refers to how satisfied the individual is with his/her health. Therefore, in this study, we have used the three items that all explicitly refer to overall QOL. However, additional analysis showed that the results remained quite similar when the original facet Overall QOL and Health was used (results not shown), which is in line with earlier findings [5].

Knowledge about the factors contributing to overall QOL at a given time point will allow health professionals to adjust follow-up management to the needs of women with early stage breast cancer. For instance, our results show that women with early stage breast cancer may benefit from a more multidisciplinary treatment; not only focussing on the medical aspects, but also discussing the psychological, social, and environmental aspects of breast cancer. Our findings have also methodological implications for the use of composite scores in (HR)QOL studies. Composite scores are often obtained by averaging scores across domains. Our study clearly shows that different aspects of life are important at different points in time. This kind of information is lost, when a composite score is used.

A major strength of this study is the longitudinal follow-up design. Due to this design, it provides insight into the longitudinal effects of QOL domains and facets on overall QOL [4]. Furthermore, the baseline measurement was done before diagnosis. Besides the inclusion of patients in different disease stages, it would be interesting to further extend the follow-up period in future studies. Breast cancer patients may experience a number of different stages of survival during their lives and their specific needs at these stages may differ [9]. In addition, it would be interesting to examine whether factors contributing to overall QOL differ in different treatment groups (chemotherapy, radiotherapy, hormone therapy).

Information regarding changes in determinants of overall QOL over time may have important implications for clinical practice. In particular, this information may help to provide psychological interventions that have a positive impact on QOL. This study identified variables that play a major role in the factors contributing to overall QOL across time. Although, these models do not imply a causal relationship, these outcomes suggest that clinicians and caregivers should focus on different domains and facets of QOL in order to improve QOL of breast cancer patients. To paraphrase George Orwell: all domains and all facets are important, but some of them are more important than others. Some of the time!

In conclusion, our results indicate that in early stage breast cancer, positive feelings and personal relationships are the predominant contributors to overall QOL during the first year after surgical treatment.

References

1. Cella, D., & Tulsky, D. S. (1990). Measuring quality of life today: Methodological aspects. *Oncology, 5*, 29–38.
2. Orley, J., Saxena, S., & Herrman, H. (1998). Quality of life and mental illness. Reflections from the perspective of the WHOQOL (editorial). *British Journal of Psychiatry, 172*, 291–293.
3. WHOQOL group. (1995). The world health organization quality of life assessment (WHOQOL): Position paper from the world health organization. *Social Science and Medicine, 41*, 1403–1409.
4. Arnold, R., Ranchor, A. V., Sanderman, R., Kempen, G. I., Ormel, J., & Suurmeijer, T. P. (2004). The relative contribution of domains of quality of life to overall quality of life for different chronic diseases. *Quality of Life Research, 13*(5), 883–896.
5. Dagnelie, P. C., Pijls-Johannesma, M. C., Lambin, P., Beijer, S., De Ruysscher, D., & Kempen, G. I. (2007). Impact of fatigue on overall quality of life in lung and breast cancer patients selected for high-dose radiotherapy. *Annals of Oncology, 18*(5), 940–944.
6. Beijer, S., Kempen, G. I., Pijls-Johannesma, M. C., de Graeff, A., & Dagnelie, P. C. (2008). Determinants of overall quality of life in preterminal cancer patients. *International Journal of Cancer, 123*(1), 232–235.
7. Sprangers, M. A., & Schwartz, C. E. (1999). Integrating response shift into health-related quality of life research: A theoretical model. *Social Science and Medicine, 48*(11), 1507–1515.
8. Leventhal, H., & Colman, S. (1997). Quality of life: A process view. *Psychology and health, 12*, 743–767.
9. Lu, W., Cui, Y., Chen, X., Zheng, Y., Gu, K., & Cai, H., et al. (2008). Changes in quality of life among breast cancer patients three years post-diagnosis. *Breast Cancer Research and Treatment, 114*, 357–369.
10. De Vries, J., & Van Heck, G. L. (1997). The world health organization quality of life assessment instrument (WHOQOL-100): Validation study with the Dutch version. *European Journal of Psychological Assessment, 13*, 164–178.
11. Philip, E. J., Merluzzi, T. V., Peterman, A., & Cronk, L. B. (2009). Measurement accuracy in assessing patient's quality of life: to weight or not to weight domains of quality of life. *Quality of Life Research, 18*(6), 775–782.
12. Suurmeijer, T. P., Reuvekamp, M. F., & Aldenkamp, B. P. (2001). Social functioning, psychological functioning, and quality of life in epilepsy. *Epilepsia, 42*, 1160–1168.
13. Cummins, R. (1998). The second approximation to an international standard for life satisfaction. *Social Indicators Research, 43*, 307–334.
14. WHOQOL Group. (1998). The world health organization quality of life assessment (WHOQOL): Development and general psychometric properties. *Social Science and Medicine, 46*, 1569–1585.
15. Power, M., Harper, A., & Bullinger, M. (1999). The world health organization WHOQOL-100: Tests of the universality of quality of life in 15 different cultural groups worldwide. *Health Psychology, 18*, 495–505.
16. WHOQOL Group. (1998). Development of the world health organization WHOQOL-BREF quality of life assessment. The WHOQOL Group. *Psychological Medicine, 28*, 551–558.
17. Den Oudsten, B. L., Van Heck, G. L., Van der Steeg, A. F., Roukema, J. A., & De Vries, J. (2009). The WHOQOL-100 has good psychometric properties in breast cancer patients. *Journal of Clinical Epidemiology, 62*(2), 195–205.
18. O'Carroll, R. E., Smith, K., Couston, M., Cossar, J. A., & Hayes, P. C. (2000). A comparison of the WHOQOL-100 and the WHOQOL-BREF in detecting change in quality of life following liver transplantation. *Quality of Life Research, 9*, 121–124.
19. Andritsch, E., Dietmaier, G., Hofmann, G., Zloklikovits, S., & Samonigg, H. (2007). Global quality of life and its potential predictors in breast cancer patients: An exploratory study. *Supportive Care in Cancer, 15*(1), 21–30.